

Ultra-Compact Stellar Systems in the Fornax Galaxy Cluster

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1 Observing the UCD/GC Interface

Ultra-compact dwarfs (UCDs) are massive but compact gravitationally-bound stellar systems discovered in the nearby Fornax [1][2][3][4][5] and Virgo [6] galaxy clusters. Several UCD formation theories have emerged - that they are ultra-massive examples of globular clusters (GCs) [4]; or stellar super-clusters created in gas-rich galaxy mergers [7]; or the remnant cores of tidally-stripped nucleated dwarf galaxies [8].

We completed spectroscopic observations in November 2004 of colour-selected point source targets ($18.00 < r' < 22.75$) in four 25' diameter VLT fields surrounding NGC1399, the massive cD galaxy at the core of the Fornax galaxy cluster (Figure 1:LEFT). Targets were selected from g'r'i' imaging with the CTIO Blanco 4m telescope [9]. We have discovered 30 new compact stellar systems at the cluster redshift, adding to 62 previously catalogued UCDs [1][2][3]. Our observations extend to the absolute magnitude range of globular clusters, enabling us to explore the UCD/GC interface ($-12 < M_{r'} < -9$) in a forthcoming paper.

2 UCD Radial Distribution and Kinematics

In Figure 1:RIGHT the radial distribution of 51 previously known Fornax UCDs for which we have u'g'r'i'z' photometry, and 30 new compact stellar systems from our VLT observations, is plotted against $M_{r'}$ magnitude. The new data show that compact stellar systems over a range of magnitudes are found extensively in intra-cluster space.

The UCD system has a mean velocity of 1478 km s^{-1} and a dispersion (σ_0) of 244 km s^{-1} . Our redshift data show weak evidence for a net rotation of the 92-member UCD system about NGC1399. The velocity gradient is $57 \pm 42 \text{ km s}^{-1} \text{ deg}^{-1}$ in R.A. from NGC1399 ($V/\sigma_0 = 0.23 \pm 0.17$). This

rotation contrasts with the finding [10] that the inner GC population ($2'$ to $9'$ radius) shows little or no rotation about NGC1399.

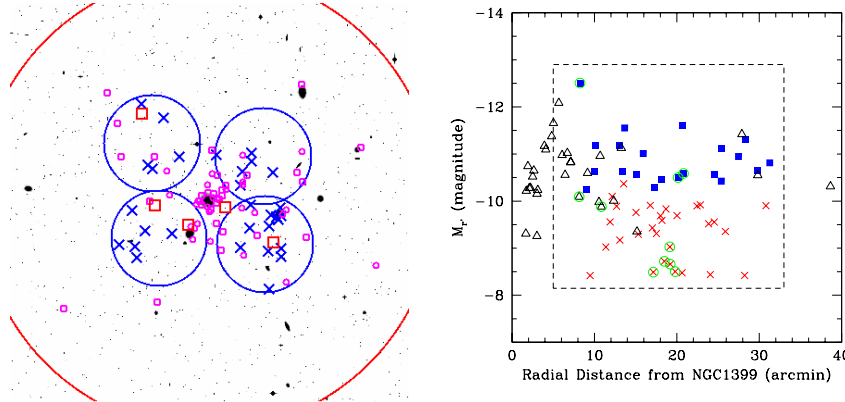


Fig. 1. LEFT: Approximately 1.5° square image of UCDs surrounding NGC1399. The 2dF field and four smaller VLT fields shown here contain previously catalogued UCDs (open small circles/squares) and newly discovered stellar systems (crosses). Our results suggest a UCD bar/filament structure stretches across NGC1399. RIGHT: M_r magnitude against radial distance from NGC1399 ($m - M = 30.9$) of 51 previously known UCDs, being those observed only with 2dF (triangles) or re-observed with VLT (squares), together with 30 newly-discovered UCDs (crosses). UCDs close to prominent cluster member galaxies other than NGC1399 are circled. The dashed rectangle shows the VLT field/magnitude outer limits.

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